



eBook

# Why Causality is Essential for Effective Performance Management Systems

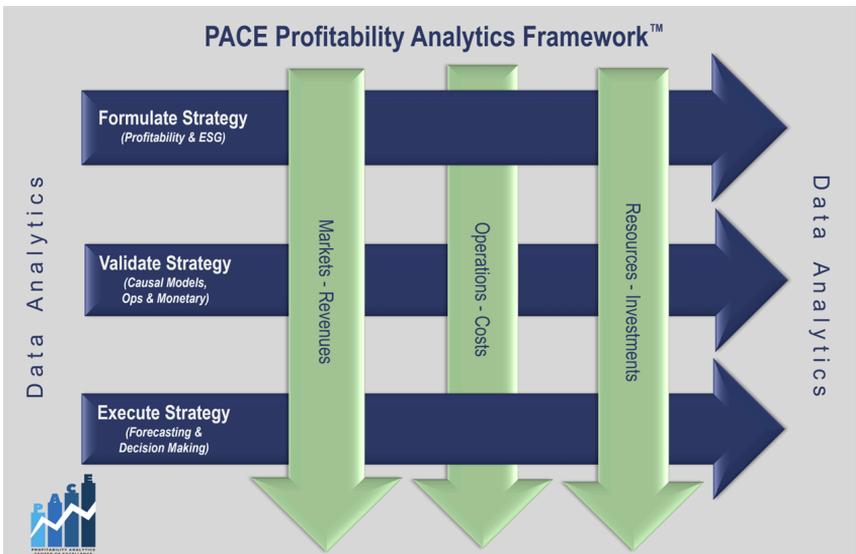
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Part of the Profitability Analytics Framework

# THE CHALLENGE

Many CFOs today encounter the challenges of poor quality data, cost information designed for external reporting rather than internal decision making, deficient budgeting and forecasting practices, a lack of collaboration across functions, and an inability to transform business data into critical insights to enable better decisions.

The Profitability Analytics Framework can help address these and other issues by providing a high-level framework that can be used to provide decision makers with comprehensive and accurate decision support information. A key element of the Framework is the principle of *causality*.



# BENEFITS

In running their organizations, managers rely on models of how their organization works. These models must be based on causality – cause and effect relationships – in order to be effective. Benefits of having causal models include:

**Better cost assignment.** Using causality to trace costs from resources to activities performed and then cost objects, organizations can obtain a more accurate understanding of their costs, including the cost of products or services provided, the cost to service customers, and more.

**More accurate projections.** By using causality in its models, an organization can better project the results of actions being considered by decision makers, to see what the future would look like if certain actions are taken or events occur, and forecast future results, and support budgeting and planning.

**Promoting organizational learning.** Modeling using causality helps an organization understand why a bad thing happened and how to avoid it, and why a good thing happened and how to repeat it. When causality is effectively applied to modeling, the operational and financial models are clearly understandable to everyone across the organization.

# NEED FOR MODELS

Providing decision makers with comprehensive and accurate decision support information requires that decision support information reflect the “truth”, in other words, be a fair reflection of the realities that surround a decision.

But the realities that surround us are complex; so complex that they can be beyond the capability of humans to fully understand. Things like how does the economy work? How does the universe work? What kind of diet will lead you to have a longer and healthier life? How do you raise children?

To survive in such a complex world, we create models that we use to guide our actions and our decisions. We create models of reality by identifying what we believe are the key elements of that reality and determining how those key elements relate to one another.

Once we establish models, they are used to guide our actions and decisions. When we create models, they must be valid, and they must be fair reflections of reality. That's where causality comes in.

# WHAT IS CAUSALITY

We create models by first identifying the key elements that drive the “real situation” and then determining how they relate to one another. What are the key factors that go into impacting whatever it is we're looking at? How do they relate to each other?

In business models for internal decision support, causality results from the actions of customers, the use of resources, and the operation of processes. Monetary models must be closely linked to an operating model of the organization to present accurate information for internal decision support. Such models can be easily distorted if separated from the underlying operating reality.

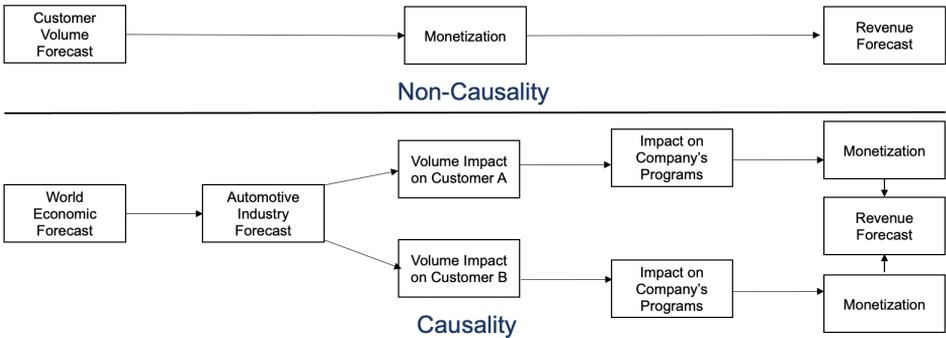
When building revenue, cost, and investment models, cause-and-effect relationships – causality - must be used to describe, quantify, and calibrate the relationships that exist between the key elements of the model. These relationships need to be real, based on the actual linkage of resources and operating processes, and not just correlations.

*“Causality, cause and effect, is the basis of logic and the scientific method. Why would finance use anything less?”*

*Larry White, Director, PACE*



Too often companies forecast their revenues as depicted in the first line of the Exhibit below: their customers give them a forecast, they attach dollars (or other currency) to it, and that's their forecast. They don't understand how the forecast is put together, how you get from wherever they are today to the future forecast, because the forecast is done for them.



If you don't understand how a forecast got put together, you can't make adjustments as time goes on. You can't perhaps see that customers were overly optimistic on one of those forecasts, that you need to adjust it down. You need to be prepared for what they project, but not necessarily plan to be at that level.

Say a company is looking to increase its revenues. An example of a noncausal approach would be for the company to set, say, a target of 8% sales growth per its strategic plan or CEO/Board decision, then monetize that plan, followed by preparation of the revenue forecast. In contrast, a causal-based approach would be for the company to take several actions to improve sales (such as increasing sales staff by 10%, targeting low-volume customers based on their growth projections, implementing product innovations, making engineering design support more available to customers and sales staff), then evaluating growth by existing customers and new customers, then monetizing the results and preparing the revenue forecast.

Causality is based on resources (e.g., employees, assets) and how things actually operate in a process. It is understanding that doing an action causes the use of certain resources, which causes other actions to be taken and other resources used, which in turn leads to a saleable product or service or another final management objective. After understanding an operating process and collecting monetary data about it, we can understand it financially and make decisions about the process and its use of resources.

*"By creating managerial costing models that more closely reflected the operation of the business, organizations will obtain a new understanding of activity and process cost that can radically change the way they operated their business."*

*Raef Lawson, Executive Director, PACE*



# TYPES OF CAUSALITY

There are two types of causality:

*Strong Causality* is where cause and effect (output/input) relationships can be quantified and traced using measurables like hours, units, transactions, headcounts, etc. These can actually be traced.

With strong causality, you can actually see, for example, where the employee is working and what they are doing. You can see the part that a machine is making; you can see and trace the nursing care to the person who's a resident in healthcare; you can trace the support of a vendor out in the field for an exhibit support company, or you can trace it to the vendor at the off-site location. There are numbers that you can trace, transactions you can trace, to link the cost to an activity or to the reason it's there.

*"The key to an effective model is causality, which is the among the various elements of the model."*

*Doug Hicks, Director, PACE*



*Weak Causality* exists where a relationship can be inferred but there is no direct quantitative measure that links the resource and activity (or activity and cost object) together. Weak causality is also called attributable. An attributable cost is a cost that would eventually go away if an output was no longer needed.

Operational and cost relationships associated with weak causality may be attributable to a group of products or services, but not a specific product or service. They may be attributable to a level of the business or segment of the business. For example, a group of design engineers may work for a product family which includes 25 products, and most of their time is focused on future design. While the design group clearly contributes to each product, any assignment methodology to current products will be inaccurate for many types of internal decisions. There is causality, but tracing costs to a specific product or service is difficult and problematic for decision support.

*“Complying with the ‘causality principle’ is an imperative. Modeling is a quantitative representation of physical realities. Without cause-and-effect relationships a model will be flawed.”*

*Gary Cokins, Director, PACE*



# CAUSALITY IN COST PROJECTIONS

Perhaps the more valuable use of causality is in projections. Causality can be used to project the results of actions being considered by decision makers to see what the future would look like if certain actions are taken or events occur, and to forecast future results and support budgeting and planning.

Causality provides a roadmap for spotting factors that can be modified to improve performance. Without causality behind a projection, a company won't have the information required to determine the reasons when actual results vary from those projections and then act upon those reasons to improve the results.

Focusing on causality ensures that the most critical factors that lead to an outcome are considered and those that are not important are excluded from decision making.

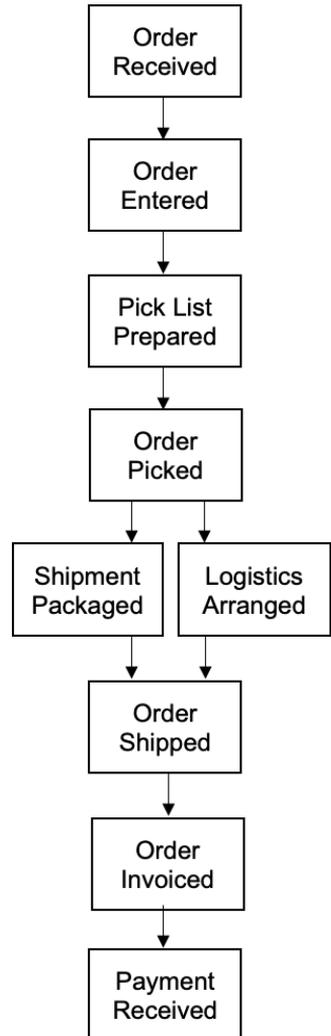
*"If management is a decision science, the financial information used should reflect the cause and effect of the underlying resources and processes."*

*Larry White, Director, PACE*

# PROJECTIONS & FORECASTS

When employed for projections and forecasts, strong causality uses operational measures to project the resources needed to support a particular volume and mix of business. Picture the chain of events in the accompanying figure where a number of actions and their effects are linked together which results in a particular outcome. In this example, when a distributor gets an order, it will cause a chain of events to occur: an order will be entered that will require picklists to be prepared. It will then require the order to be picked, the shipment packaged, logistics arranged, the order shipped and invoiced, and receipt of the payment. Each order received will drive this series of events.

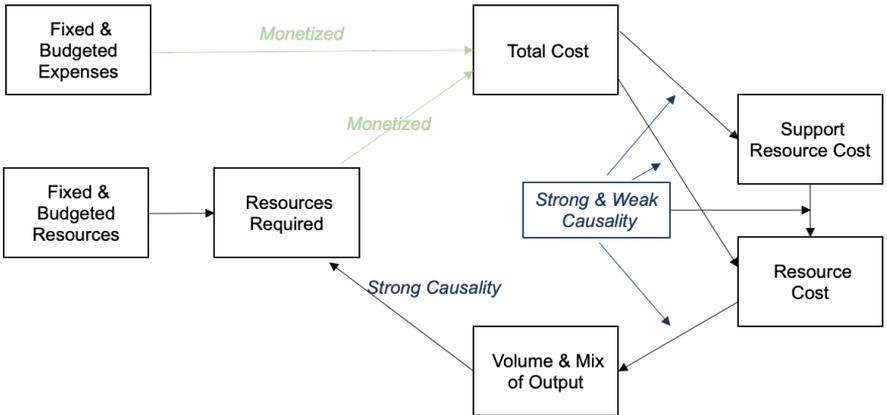
You can use the number of orders to be able to project the level of work that will be required at various stops along the chain. The number of orders received in turn should come from the revenue forecast, also based on causal relationships.



When projecting the total cost of a particular volume and mix of businesses, strong and weak causal relationships may be employed. While solely relying on strong relationships is theoretically preferable, this approach is often used based on cost/benefit trade-offs, time constraints, and the availability of necessary information.

As an example, consider the figure on the next page. Starting at the bottom, strong causality drives much of the resource consumption (although the structure of the existing financial and operating systems will affect how many things can be found that are driven by strong causality). These get combined with fixed or budgeted resources. For example, these might include the number of people in the accounting department, which isn't driven strongly by volume and mix of business until a certain point is reached.

These resources are then monetized to derive total costs. There are also fixed and budgeted expenses that come in monetized, including things that an organization decides it's going to do or are unavoidable. Both strong and weak causality are then used to assign total cost to the cost to support resources and then to distribute those support resource costs to the resources that touch the cost objectives or the individual items that make up the business.



*Warning: Watch for idle capacity and variable costs*

A common cost modeling mistake is failing to consider the impact of idle/excess capacity in a process. If idle/excess capacity is not identified within the resource groups at each of the subsequent steps, the quantity of resources and hence the cost of all the resources in each block will be “pushed” through the process. This results in inaccurate cost information for decision making, and a lost opportunity to use the idle/excess capacity for a more productive purpose or take cost savings, if possible. Idle/excess capacity is never causal because it can be put to any number of alternative uses. When planning and projecting, only the resources that are projected to be used (and their costs) should be moved from resource group to resource group through the process.

It is also important to remember that both fixed and proportional/variable costs are causal and the causal relationship can range from strong to very weak. If fixed costs are assigned, they should be clearly identified as fixed since the assignment may make them appear to be variable, which can lead to incorrect decisions.

In many organizations, existing accounting and/or operating systems are not set up to trace or collect strong causal information, particularly those originating from administrative and support areas. You should not assume strong causal relationships do not exist because information is not currently available. Improving the representation of causality in operational and financial models is critical to improving internal decision support information.

*"Causality must be at the core of **management** accounting systems. Otherwise, how can expected outcomes ever follow management decisions?"*

*Monte Swain, Director, PACE*

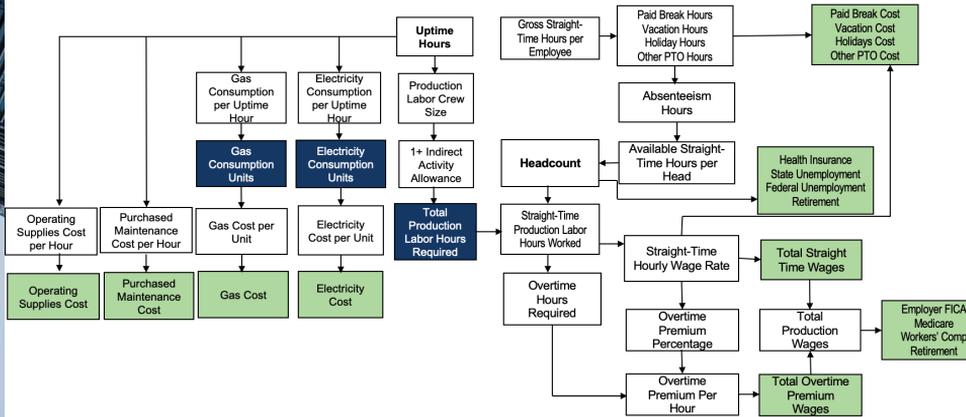


# MANUFACTURING EXAMPLE

A manufacturing company wishes to project the costs depicted below.

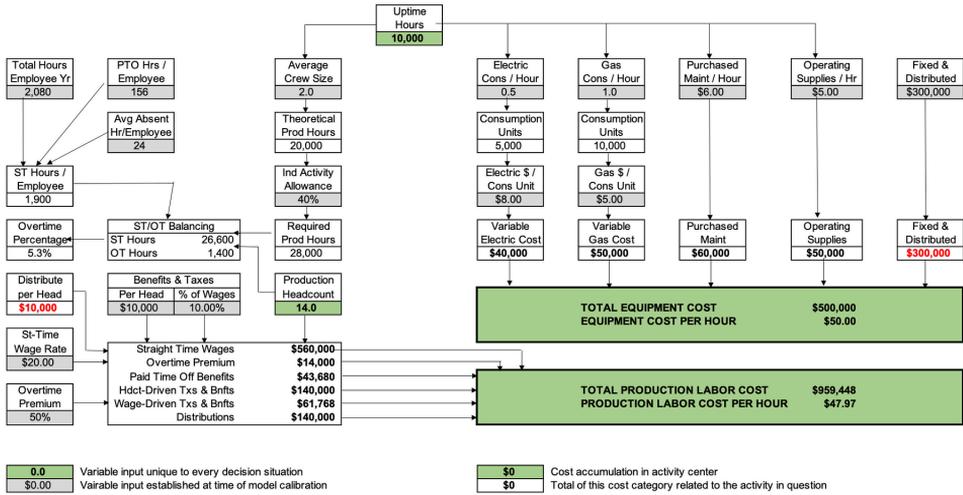
Operating Supplies Cost	Purchased Maintenance Cost	Gas Cost
Paid Break Cost Vacation Cost Holiday Cost Other PTO Cost	Health Insurance State Unemployment Federal Unemployment Retirement	Total Straight- time Wages
Total Overtime Premium Wages	Employer FICA Medicare Workers' Comp	Electricity Cost

For this company, these cost elements are not disassociated from each other. They are all connected by causality and triggered by uptime hours. Based on an understanding of the relevant operational relationships, shown on the next page, more realistic causality-based projections can be made.



In this example, uptime hours drives the consumption of resources such as operating supplies and purchase maintenance. That can be turned into a cost per hour of uptime. It determines quantities such as electric and gas consumption, which would be expressed in units, (BTUs or kilowatt hours). When monetized with the cost per unit, electric costs are derived.

Uptime hours determine the production labor hours required. With the addition of another factor, headcount, employment-related costs can be determined. Headcount determines the difference between whether you're going to work overtime or hire more people, which drives a lot of these other costs.



Using a causality-based model such as this, and because the company understands the chain of events, it can engage in scenario planning and see the impact of changes in planned volume or of process improvements. For example, if the number of required Uptime Hours increases from 10,000 to 14,000 (and all other relationships remained unchanged) the production headcount would need to increase from 14 to 17.

# SERVICE INDUSTRY EXAMPLE

Driver-based planning is equally applicable to manufacturing and service industries. In the long-term care facility example below, the relevant cost drivers were the volume and mix of residents and their levels of acuity, which drove the need for nursing services.

There are four categories of residents which range from sub-acute dementia to skilled nursing and assisted living. Within sub-acute, there are four levels. Based on studies that detail the number of eight hours shifts of a registered nurse, a licensed practical nurse, and nurses required for each type of patient per day, a causal model can be constructed to project the amount of each type of nursing hours required (see the Exhibit below).

Causality-Based Nursing Hour Demand  
Long-Term Care Facility

THE CAUSE				
Unit	Resident Days by Care Level			
	Base Level	Level No. 1	Level No. 2	Level No. 3
Sub-Acute	700	1,800	1,100	2,100
Dementia	8,800			
Skilled Nursing	19,800			
Assisted Living	6,200			

THE EFFECT					
Unit / Level	Resident Days	Hours Required per Patient Day			
		Reg Nurse	LP Nurse	Nursing Aide	
<u>Sub-Acute</u>					
Base Level	700 Resident Days	1.00	0.40	1.80	
Level No. 1	1,800 Resident Days	1.70	0.40	1.50	
Level No. 2	1,100 Resident Days	2.00	0.50	1.60	
Level No. 3	2,100 Resident Days	3.50	0.50	1.80	
Sub-Acute Nursing Hours		13,310	2,600	9,500	
<u>Dementia</u>					
Base Level	8,800 Resident Days	0.50	1.00	2.00	
Dementia Nursing Hours		4,400	8,800	17,600	
<u>Skilled Nursing</u>					
Base Level	19,800 Resident Days	0.25	0.75	1.75	
Skilled Nursing Hours		4,950	14,850	34,650	
<u>Assisted Living</u>					
Base Level	6,200 Resident Days	0.00	0.50	1.50	
Assisted Living Nursing Hours		0	3,100	9,300	
Total Nursing Hours Required		22,660	29,350	71,050	

From a capacity standpoint, the model can be used to determine whether there are sufficient resources in the market to meet projected demand. Similar causal models can be constructed for other services, including laundry and dietary services.

*"In the absence of facts, anyone's opinion is a good one. Applying causality provides the facts needed to enable insights for good decisions. Without applying causality, a performance management system will be fiction."*

*Gary Cokins, Director, PACE*

# CAUSALITY IN ASSIGNMENTS

In costing, causality should be used to:

- Trace and assign costs from resources to outputs and objectives,
- Assign support resources to the resources that actually support cost objectives, and
- Distribute the consumption of resources such as human resources departments and accounting departments down to cost objects (such as production people, field service personnel and customers) where causal relationships exist.

Causality can be used to assign the operational quantities from resources to the cost objectives themselves, to the objective assigned to the customer, or to the product or service provided.

*"Accountants who are committed to discovering and designing around causality are true partners in financial planning and analysis (FP&A) process for their organization."*

*Monte Swain, Director, PACE*

## *Strong Causality in Assignments*

**Strong causality** can be used to assign the operational quantities and cost of support resources to the resources that require their support when there is a measurable (output/input) link. It is evidenced by the ability to trace the operational quantities and cost of resources and activities to cost and other managerial objectives when there are appropriate measurables and transactions.

Examples include:

Human Resources		Headcount
Building & Grounds		Square Feet
Equipment Maintenance		Equipment Hours
Supervision		Headcount

While these examples may seem like traditional allocation practices, it's important to note the need for a strong causal relationship to exist. In general, Human Resources may be driven by a variety of drivers, including hiring actions, payroll complexity, and number of disciplinary actions. Using headcount as a driver may be done based on materiality or organizational simplicity/complexity, but care should be taken in order to include strong causal relationships wherever feasible.

Note that strong causality does not imply that a linear relationship exists. For example, a two person increase in headcount does not necessarily imply a corresponding increase in Human Resource is required.

# STRONG CAUSALITY EXAMPLE

In the previous nursing home example, the cost of the Human Resource department could be assigned based on headcount in the various areas, as depicted below. This is useful for general planning and general price setting. Further refinement of the assignment could be made based on more granular drivers if this cost is significant to the organization, such as the proportion of salaried versus hourly employees in a department, number of hiring actions, frequency of payroll, etc. The use of more detailed drivers (based on better causal analysis and data collection), where appropriate, make the causal relationships contained in the model stronger.

Human Resource Assignment - Unweighted

Activity Center	Salary Headcount	Hourly Headcount	Total Headcount	Effort Percentages	Hum Res Distribution
Plant Operations	1.0	3.0	4.0	2.3%	\$6,897
Sewer Costs	0.0	1.0	1.0	0.6%	\$1,724
Housekeeping	0.0	12.0	12.0	6.9%	\$20,690
Laundry Operations	3.0	3.0	6.0	3.4%	\$10,345
Dietary Planning	1.0	0.0	1.0	0.6%	\$1,724
Dietary Preparation	0.0	32.0	32.0	18.4%	\$55,172
Staff Education	1.0	0.0	1.0	0.6%	\$1,724
Nursing Administration A	4.0	4.0	8.0	4.6%	\$13,793
MDS Coordination	1.0	0.0	1.0	0.6%	\$1,724
Restorative Nursing	2.0	0.0	2.0	1.1%	\$3,448
Medical Records	0.0	2.0	2.0	1.1%	\$3,448
Marketing	2.0	0.0	2.0	1.1%	\$3,448
Social Services	3.0	0.0	3.0	1.7%	\$5,172
Beauty & Barber Services	2.0	0.0	2.0	1.1%	\$3,448
Transportation	1.0	0.0	1.0	0.6%	\$1,724
Activities	2.0	7.0	9.0	5.2%	\$15,517
Nursing Administration B	2.0	1.0	3.0	1.7%	\$5,172
RN Nursing	0.0	1.0	1.0	0.6%	\$1,724
LPN Nursing	0.0	19.0	19.0	10.9%	\$32,759
Nurses' Aid	0.0	62.0	62.0	35.6%	\$106,897
General & Administration	1.0	1.0	2.0	1.1%	\$3,448
<b>Totals</b>	<b>26.0</b>	<b>148.0</b>	<b>174.0</b>	<b>100.0%</b>	<b>\$300,000</b>

### *Weak Causality in Assignments*

**Weak causality** can be used to assign the cost of support resources to the resources or activities that require their support when causality can be inferred, but either there is no measurable operational quantity, or materiality makes using operational quantities “overkill.”

Examples include:

- Associating resources/activities involved in marketing to Customer A and sales to Customer A (although in many cases there will be a strong causal relationship).
- Associating resources/activities involved in supporting Product Line 1 and the sale of Product Line 1’s products.
- Associating extra costs involved in dealing with “difficult” customers and the products or services sold to those customers (e.g., extra long complaint calls).

When making these types of weak causal allocations, the risk of distorting decisions should be carefully evaluated as the underlying measurement made for the allocation can change over time and would not be reflected in the data.

*“Models are specious without causality.”*

*Doug Hicks, Director, PACE*

# WEAK CAUSALITY EXAMPLE

The following example deals with the Purchasing Department of a manufacturing company. We know its costs are related to the items purchased, but there is no strong link to the various things purchased, which are very different. In this case we can use the best estimates of the most qualified individuals to allocate the cost to the various departments.

It's important to see that the cost of Purchasing is being allocated to the items purchased. It is not being added to some general overhead rate and allocated everywhere, but rather being allocated to the appropriate cost objects.

## Purchasing Distribution - Weak Causality

Activity Center	Activity Analysis	Purchasing Distribution
Deco Plastics	15%	\$45,000
Electronics	5%	\$15,000
Circuit Boards	12%	\$36,000
Corrugated	3%	\$9,000
Resins	2%	\$6,000
Fiber Optics	5%	\$15,000
Outside Inspection	5%	\$15,000
Stampings	10%	\$30,000
Sub-Assemblies	25%	\$75,000
Adv Adhesive	3%	\$9,000
Tooling - Moldings	10%	\$30,000
Tooling - Other	5%	\$15,000
Totals	100%	\$300,000

## **Warning: Some weak causal costs should not be allocated**

Judgement must be used in monetarily assigning weak causal costs to specific products or services because significant distortions can be introduced. For example, the weak causal costs will probably not respond to volume changes in individual products or services when making short to intermediate-term decisions. However, there are some decisions where assigning weak causal costs is useful, such as for setting base pricing for a longer-term period.

There comes a point with weak causality where the causal relationship is so weak it essentially does not exist. Relationships this weak should never be assigned to products, services, customers, etc. for internal decision support purposes.

There are some decisions for which the assignment of these “associated but not traceable” activities and costs is essential and many others for which it is irrelevant or, even worse, deceptive.

There are different costs for different purposes – understanding where and when to use each one is just as important as the cost model used to create that cost information. In pricing decisions, any costs that are not assigned to a product, service, or customer are subconsciously added as a percentage to those costs that are assigned. This is not always the best or most logical approach.

# SG&A ALLOCATION BASIS SHOULD ALSO BE CAUSALLY LINKED

Even for weak causality, the base used matters. In the example on the next page, a company spends \$1 million on outside goods and services and a similar amount on activities performed within the organization, for a total cost of \$2 million.

It also incurs an additional \$200,00 in Selling, General & Administrative (SG&A) costs. In traditional accounting that would be turned into a 10% SG&A rate. However, an alternative approach would be to turn it into a rate based on the things it was incurred to support. That would be the activities performed within the organization, yielding a 20% rate.

The impact of using the two different rates is shown in the lower half of the next exhibit. Products A and B consume the same amount of internal activities but would be allocated a greater amount of SG&A under the traditional allocation method. Products A and C consume the same amount of total activities but differ in the internal/external split; again, the overhead allocation varies depending on the basis used for the SG&A allocation.

Prices paid to outside organizations for goods and services	\$1,000,000
Cost of activities performed by the organization	<u>\$1,000,000</u>
Total costs	\$2,000,000
Selling, general and administration costs	\$200,000
SG&A rate based on total cost	10%
SG&A rate based on activity cost	20%

	Output A	Output B	Output C	Output D
Prices paid to outside organizations for goods and services	\$3,000	\$0	\$7,000	\$0
Cost of activities performed by the organization	<u>\$7,000</u>	<u>\$7,000</u>	<u>\$3,000</u>	<u>\$3,000</u>
Total cost of product or service	<u>\$10,000</u>	<u>\$7,000</u>	<u>\$10,000</u>	<u>\$3,000</u>
SG&A rate based on total cost	<u>\$1,000</u>	<u>\$700</u>	<u>\$1,000</u>	<u>\$300</u>
SG&A rate based on activity cost	<u>\$1,400</u>	<u>\$1,400</u>	<u>\$600</u>	<u>\$600</u>

*"Complying with the 'causality principle' is an imperative. Modeling is a quantitative representation of physical realities. Without cause-and-effect relationships a model will be flawed."*

*Gary Cokins, Director, PACE*

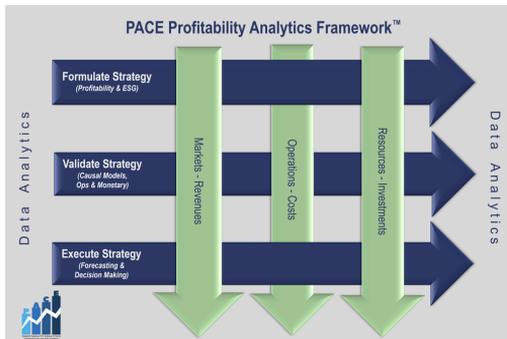
# PROFITABILITY ANALYTICS FRAMEWORK

Causality underlies each stage of the Profitability Analytics Framework:

In the Strategy Formulation phase, an organization establishes its plan for identifying and addressing its market(s) and for mobilizing its investments and resources to meet the demands created by that plan. These plans should be based on causal models of the organization and its resources.

In Strategy Validation, causal models are developed that directly enable the evaluation of strategy. These models employ the principle of causality to quantify, in operational and monetary terms, the revenue and cost impacts of an organization's strategy and then track the execution and performance of that strategy. In a sense, this validation stage asks, "Can you afford your formulated strategy?"

Strategy Execution involves decision making that employs the outputs of the causal models to provide the organization's decision makers with the accurate and relevant information they need to make economically sound decisions as they execute and adapt tactics to meet strategic goals.



Now that you know more about causality, we invite you to explore the Profitability Analytics Center of Excellence Library for podcasts, webcasts, case studies, articles, and other eBooks on this and other related topics.

Contact us: [ProfitabilityAnalytics@gmail.com](mailto:ProfitabilityAnalytics@gmail.com)  
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